

U.S. Department of Energy,
Office of Integration and
Disposition

TIE QUARTERLY

Technical Information
Exchange: "Sharing Experience,
Expertise, and Lessons Learned."

Sandia National Laboratories

Background

Sandia National Laboratories' roots go back to World War II and the Manhattan Project. Prior to the United States formally entering the war, the U.S. Army leased land adjacent to an Albuquerque, New Mexico airport known as Oxnard Field, to service transient Army and Navy aircraft. In January 1941 construction began on the Albuquerque Army Air Base, leading to establishment of the "Bombardier School-Army Advanced Flying School" near the end of the year. Soon thereafter it was renamed Kirtland Field, after early Army military pilot Colonel Roy S. Kirtland, and in mid-1942 the Army acquired Oxnard Field. During the war years facilities were expanded further and Kirtland Field served as a major Army Air Forces training installation.

In the months leading up to successful detonation of the first atomic bomb, the Trinity Project, and delivery of the first airborne atomic weapon, the Alberta Project, J. Robert Oppenheimer, Director of Los Alamos Laboratory, and his technical advisor, Hartly Rowe, began looking for a new site conve-

nient to Los Alamos for the continuation of weapons development – especially its non-nuclear aspects. They felt a separate division would be best to perform these functions. Kirtland had fulfilled Los Alamos' transportation needs for both the Trinity and Alberta projects, thus, Oxnard Field was transferred from the jurisdiction of the Army Air Corps to the U.S. Army Service Forces Chief of Engineer District, and thereafter, assigned to the Manhattan Engineer District. In July 1945, the forerunner of Sandia Laboratory, known as "Z" Division, was established at Oxnard Field to handle future weapons development, testing, and bomb assembly for the Manhattan Engineer District. The District-directive calling for establishing a secure area and construction of "Z" Division facilities referred to this as "Sandia Base" – apparently the first official recognition of the "Sandia" name.

Sandia Laboratory was operated by the University of California until 1949, when President Truman asked American Telephone and Telegraph (AT&T) to assume the operation as an "opportunity to render an exceptional service in the national

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SNL and Albuquerque Welcome TIE Back after Ten Years

Has it been 10 years?? You bet — and this year also marks the tenth anniversary of TIE.

The two words that best describe why the TIE Workshop and the *TIE Quarterly* continue to be successful are — SHARING INFORMATION! And TIE is still all about sharing information. TIE Workshops provide excellent opportunities for peers and stakeholders from across the DOE Complex to get together share their experiences and expertise, exchange concepts, plans, and design ideas, and discuss problems of mutual concern. TIE continues the endeavors to both promote complex-wide working level communications and to assist in making Environmental Management a better informed community. The *TIE Quarterly* and the TIE website (www.em.doe.gov/tie) complement the communications endeavor by providing timely articles and news regarding site-specific and Headquarters activities, chronicling workshop proceedings, and serving as an information resource.

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From the Desk of Patty Bubar

Plans are well underway for the November TIE Workshop to be held in Albuquerque, New Mexico, and all

indications are that it will surpass last year's very successful workshop held in Augusta, Georgia, in both the breadth of timely session topics and the number of presentations anticipated. As in past workshops, the Augusta workshop resulted in renewing and establishing lines of communications between colleagues, sharing information and expertise with peers, and discussing the valuable lessons learned through experience — which, by the way, have been captured on the Lessons Learned website, www.em.doe.gov/lessons. I have no doubt the Albuquerque workshop will continue this increasingly important TIE Workshop legacy.

Dave Huizenga, Deputy Assistant Secretary for the Office of Integration and Disposition (EM-20), and I look forward to

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PU&D Yard Plume Treatability Study

A plume of volatile organic compound (VOC) contaminated ground water emanates from a localized contaminant source in the Property Utilization and Disposal (PU&D) Yard at Rocky Flats Environmental Technology Site. The primary contaminant is tetrachloroethene. Ground water at this location occurs in the Rocky Flats Alluvium, comprised of poorly sorted clayey gravel and sand with abundant cobble and boulder-sized material and discontinuous lenses of clay, silt, and sand. Depth to ground water is 5 to 20 feet below the surface, and the average ground water flow rate is approximately 100 feet per year.

A treatability study is in progress to evaluate the effectiveness of Hydrogen Release Compound (HRC™) in stimulating rapid degradation of chlorinated VOCs in PU&D Yard Plume ground water and soil. HRC™ is a proprietary, environmentally safe, food quality, polylactate ester. The one-time application is expected to stimulate contaminant degradation for approximately one year.

HRC™ has been used at other sites to stimulate rapid degradation of chlorinated VOC contaminants in ground water and



soil. This study will evaluate the effectiveness of HRC™ in the low flow ground water regimes common at Rocky Flats.

The study is taking place in the highest contaminant concentration portion of the PU&D Yard Plume, immediately adjacent to the source area. Baseline ground water samples were collected, then approximately 800 pounds of HRC™ were placed into the subsurface. Insertion of the HRC™ was completed on March 1, 2001. The subsurface

conditions are expected to stabilize over the next two months. Ground water samples are currently being collected to monitor the effect.

This study is a cooperative effort between Rocky Flats and the Department of Energy Subsurface Contaminant Focus Area (SCFA), with funding provided by the SCFA.

For more information contact Norma Castaneda, DOE Rocky Flats Field Office or 303-966-4226 or norma.castaneda@rf.doe.gov, Annette Primrose, Kaiser-Hill at 303-966-4385 or annette.primrose@rfets.gov.

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attending the workshop again this year, to observe and participate in the many excellent sessions. In addition, I plan to introduce and discuss an outreach initiative EM-20 is implementing this year to; a) aid us in understanding the field's integration and disposition needs, b) communicate to the field the EM-20 integration products and services available, and c) establish a framework for regular communication and collaboration regarding activities and resources. The initiative is intended to enhance overall effectiveness through coordinated planning and integration. This activity is one of several EM-20 is undertaking to surface issues which require, or will benefit

from, Headquarters' attention and assistance. TIE workshops provide a tremendous forum and opportunity for us to glean responses, reactions, and creative ideas from the field, and we value that feedback.

Thank you, and keep up the good work. I'll see you in Albuquerque!

*Patty Bubar
Associate Deputy Assistant
Secretary Integration and Disposition*

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In-Situ Object Counting System NTS Deployment

The Nevada Test Site (NTS), like a lot of U. S. Department of Energy (DOE) sites, is looking for innovative technologies that can reduce the cost associated with radiological characterization of materials and waste generated during the deactivation and decommissioning of equipment and structures at the NTS.

The In-Situ Object Counting System (ISOCS) developed by Canberra was deployed by Brookhaven National Laboratory (BNL) using EM-50 Accelerated Site Technology Deployment (ASTD) funding. During the 2000 Deactivation and Decommissioning (D&D) Focus Area mid-year review, details on the BNL ISOCS deployment were presented. Based on this presentation, NTS personnel visited the BNL site to determine if the ISOCS could be used to support the NTS D&D program.

An ISOCS system consists of a portable high purity germanium detector and multi-channel analyzer (MCA) that is connected to a lap top computer loaded with specialized software developed by Canberra. The ISOCS software, when used with a characterized detector, allows the geometry of the object to be modeled producing an efficiency calibration for that object. The spectrum acquired with the specially characterized detector is then corrected with the mathematically developed efficiency calibration, resulting in an accurate estimate of the activity of gamma emitting radionuclides contained within the object (Figure 1). To simplify the process, a calibration curve for a three dimensional model of a 55-gallon drum, B-25 box, or sample bottle can be developed by simply entering its geometric and physical (density and molecular composition) description into the software model to generate correction factors.

NTS intends to use the unique capabilities of ISOCS for final Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) release surveys of soil and surfaces. Additionally, NTS will use the ISOCS system as the primary tool for waste package activity determinations. Each of these applications is discussed below.

MARSSIM Release Surveys

NTS received ASTD funding to deploy MARSSIM final verification status surveys of a structure slated for D&D. One area that was of concern to the NTS D&D program was how to cost effectively survey various layers of multi-layered roofs. The baseline technology would require removal and hand screening of each portion of the roof. This increases project costs

and impacts project schedule. The ISOCS system allows for screening of all layers of the roof in-situ prior to removal. The roofing material can be compared to project and site release levels, and a waste determination can be made prior to removal activities. The use of ISOCS in conjunction with the MARSSIM

methodology will reduce project costs and accelerate baseline closure schedules.

Waste Characterization

At NTS, the current baseline technology for waste packages is to either pre-characterize the waste before packaging (for small limited volume waste streams) or to collect discrete samples from each of the waste packages (for larger waste

streams). This is an expensive and lengthy process and it is questionable - can a limited number of samples can be considered to truly be representative of the waste. In addition to cost, schedule, and representative concerns, workers are potentially exposed to radiation during the sampling process. The above issue can be addressed by using ISOCS for waste characterization.

ISOCS waste characterization requires that the data collected during the site characterization is sufficient to gain approval of the waste stream prior to generating the waste. At NTS, based on site characterization data, an acceptable concentration range is developed for each nuclide of concern. A scaling factor between Cs-137 (Cs-137 was chosen because it was easy to detect and is present in all characterization samples) and each non-gamma emitting nuclide of concern was developed. ISOCS is then used to measure the concentration of Cs-137 within the waste container and the other nuclides of concern are calculated using the approved scaling factors.

Site Remediation

ISOCS is also an excellent technology to use during radiologically impacted soil removal activities. ISOCS can be configured to analyze soil sample bottles. Results of the ISOCS sample bottle analysis can be used to control the extent and amount of soil excavation required to achieve site closure criteria. This approach was used successfully at the BNL Graphite Research Reactor project. Use of ISOCS can also reduce the risk of exceeding closure criteria in the final verification samples. Prior



ISOCS Deacter analyzing B-25 Waste Box

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to submitting verification samples to the project radiological laboratory, the samples can be screened using ISOCS. If ISOCS detects concentrations of nuclides above closure criteria, additional soil can be excavated and another verification sample collected. Use of ISOCS will reduce the volume of soil excavated, the number of samples sent for laboratory analysis, and the risk of not meeting closure criteria.

Conclusion

Deployment of Canberra is ISOCS at NTS is anticipated to significantly reduce waste characterization costs, accelerate MARSSIM final status roof surveys, and reduce waste volume of radiological impacted soil removals. The deployment of ISOCS

at NTS is supported by the EM-50 D&D Focus Area. Funding from the D&D Focus Area is paying for BNL support of the NTS deployment and for D&D exterior MARSSIM final status surveys. The training of NTS personnel by BNL on ISOCS operation and software applications has been essential for the successful deployment at NTS. In addition, adaption of BNL procedures, operating instructions, and quality assurance program has greatly reduced NTS ISOCS implementation costs.

For more information contact Jeffrey L. Smith, U.S. Department of Energy, Nevada Operations Offices at (702) 295-7775 or smithjl@nv.doe.gov.

**Don't forget to register
for the TIE Workshop!**

Guzzler™ Vacuum System Deployed at Hanford Site for Soil Sampling in Heavily Industrialized Area

Characterization of subsurface soils can be readily accomplished in many instances using drilling or cone penetrometer technologies or by digging a test pit with a backhoe. Problems with these conventional subsurface access techniques arise when working in an industrial setting where subsurface obstacles such as utilities may be encountered. In areas with a well-developed infrastructure, these obstacles can severely constrain subsurface access and/or present significant safety hazards that must be addressed in planning for subsurface excavations. The inability to sample in such areas may severely impact schedules, budgets, and regulatory compliance.

Bechtel Hanford, Inc. (BHI) is responsible for characterizing and remediating subsurface uranium-contaminated soils in the Hanford Site's 300 Area. This heavily industrialized area has been used for fuel fabrication and reactor research activities. Soil samples from an area crowded with underground utilities were required to support a laboratory study that focused on refining the remedial action goals for uranium. Characterization using conventional subsurface access techniques would have been costly and slow.

The solution to this challenge was found in the Guzzler™ vacuum system (The Guzzler™ vacuum system is a registered trademark of Guzzler™ Manufacturing, Inc., Streator, Illinois.). The Guzzler™ is a powerful, truck-mounted industrial vacuum

system deploying an 8-in. diameter inlet hose that can pull up to 27-in. mercury vacuum. The system can excavate wet or dry unconsolidated materials. Material removed by the Guzzler™ is loaded into a hopper with a capacity of 14 yd³. Cyclone

separators, bag filters, micro strainers, and high-efficiency particulate air filters are used to contain particles in the exiting air stream. With these features, the Guzzler™ was suitable for use in excavating and collecting subsurface soils in uranium-contaminated areas.

The Guzzler™ was deployed to characterize soils for uranium contamination to a depth of 15 ft. Because the vacuum excavation technique minimized concerns

about damaging underground utilities, the Guzzler™ excavated to the 15-ft depth in less than one hour. During the excavation, radiation surveying equipment was lowered into the holes to survey the soil at 1-ft intervals. Using the Guzzler™, BHI successfully completed characterization efforts in the industrial setting of the Hanford Site's 300 Area at lower cost and with lower safety risks than would have been possible with conventional subsurface access techniques.

For additional information about this technology deployment, contact Scott Petersen of BHI's Technology Application group at swpeters@bhi-erc.com.



Guzzler conducting soil sampling in the Hanford 300 Area

Monolayer Vegetative Cover Deployment at the Nevada Test Site

The Nevada Test Site (NTS), as at other U. S. Department of Energy (DOE) sites, has a number of their Resource Conservation and Recovery Act (RCRA) and low-level waste (LLW) landfills scheduled to be closed by 2011. At NTS, a minimum of 92 acres of landfill will be closed during this time period. To address this problem, the National Nuclear Security Administration, Nevada Operations Office started developing alternative cover designs in 1993. When the process was begun, the standard cover design was a multilayered low permeability [hydraulic conductivity of less than 10^{-6} centimeters (cm) per second] design developed by the U. S. Environmental Protection Agency (EPA). NTS is located in the high desert with an average rainfall of less than 25 cm per year. The depth to ground water at NTS LLW landfills ranges from 215 meters (m) to 490 m below ground surface. These are not ideal conditions in which to deploy a multilayer cover design. Another design consideration at NTS was meeting the design life criteria required under DOE Order 435.1. The cover design needs to have a design life of 1,000 years, versus a 30-year design life mandated by the EPA multilayer design. An additional key design issue was cover maintenance, the cover had to be able to provide waste protection with limited or no long-term maintenance. A traditional multilayer cover design is not self-healing. Once the layers are breached the integrity of the waste unit is compromised and waste transport becomes possible.

A number of alternative cover designs were being developed around the DOE complex. These alternative designs were evaluated in a NNSA/NV alternative cover workshop held in 1994. The purpose of the workshop was to bring together vadose zone experts from across the complex to develop an NTS site-specific cover design. The initial NTS cover design was a modification of the Hanford Cover model. The Hanford Cover model was variation of the EPA multilayered cover design. Before this design could be deployed, NTS specific characterization data had to be collected to support the closure design. Information required to support the cover design included: ground water depth, vadose zone hydraulic properties, alluvial geologic properties, historic climate evaluation, current climate evaluation, flood evaluations, landfill subsidence projections, animal and plant intrusion impact, and water balance experiments.

Based on the characterization data generated, NNSA/NV held a second alternative cover design workshop in 1998. The previous cover design was rejected due to the projected subsidence calculated at NTS LLW landfills. Projected subsidence of 3 to 5 m was estimated for waste units that were installed in old nuclear test subsidence craters. A multilayer cover design would fail under that much differential settling. Once the layers are breached it is difficult and expensive to repair the cover, and the waste unit is vulnerable to precipitation. The outcome of the 1998 workshop was the decision to deploy a monolayer cover at NTS. The key reason was that, in the event of landfill subsidence, a monolayer cover is self-sealing. The only main-

tenance required is adding additional soil to direct rainfall off the cover. The use of a monolayer cover solves the subsidence problem, but does a monolayer cover meet the DOE Order 435.1 performance criteria?

In 1993, a weighing lysimeter facility was installed at NTS. The purpose of the facility

was to gather data for a water balance. Two weighing lysimeters were installed, one vegetated and one with bare soil (Figure 1). Lysimeter data indicated that even the bare soil lysimeter was effective in removing moisture out of the lysimeter plot. However, the vegetative lysimeter was able to reduce the penetration depth of the wetting front and transpire moisture out of the system to steady state moisture levels within days of most precipitation events, and within two months of sustained winter rains. The lysimeter data validated that a monolayer cover design, used in conjunction with shallow rooting native vegetation, provides a barrier sufficient to protect NTS landfill waste units.

The majority of landfills at NTS have operational covers that were installed after the waste cells were filled. The thickness of these operational covers depend on the type of waste disposed within the waste trench. Most LLW waste trenches have a 2.5 to 3 m native soil operational cover. One-dimensional vadose computer modeling has determined that a monolayer cover thickness of 1.5 m is a sufficient barrier to protect the waste unit from precipitation events.



Area 5 Lysimeter Facility

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Survey Remote Prismless Total Station

As environmental cleanup at the Fernald Environmental Management Project (Fernald) accelerates toward closure, the innovative Survey Remote Prismless Total Station (RPTS) plays a key role – since land survey measurements are vital in supporting engineering, construction and environmental remediation activities. This sophisticated system incorporates reflectorless laser distance measuring technology into the surveying instrument, the latest advancement in “total station” technology. “Reflectorless” or “prismless” measurements allow a single instrument operator to make highly accurate survey measurements to remote, inaccessible, or hazardous locations. The surveying instrument has an onboard data collection computer, and the robotic total station utilizes an internal servo tracking system that automatically follows the surveyor’s position. It also includes a coaxial automatic target recognition system capable of providing prismless measurements of more than 500 feet. Since the total station deployment in February 2001, Fernald has achieved safer work practices, reduced worker exposure to hazardous environments, and significantly reduced personnel costs.

RPTS provides daily support to construction of the Fernald On-Site Disposal Facility (OSDF), a multi-layer cap and liner system constructed of natural materials, such as clay and gravel, and man-made materials, such as high-density plastic. It is being built to permanently store low-level radioactive waste produced during 37 years of uranium processing. During construction, borrow soil is excavated and screen sized for use in the multi-layer liner and cap. Land survey measurements are taken at multiple intervals during construction of the liner, dur-



Steve McCracken, Director (left) of DOE-Fernald observes the surveying instrument at work at the On-Site Disposal Facility

tem and automated scanning feature allows instrument operators involved in construction of access and haul roads to monitor progress of excavation activities, document the precise location of facilities, and make highly accurate survey measurements on remote or inaccessible locations. Focusing prior to measurement is unnecessary, since the instrument is simply aimed at the target using a visible laser dot which confirms the measurement position.

Robotic operation of RPTS automatically tracks the surveyor’s position, reducing the survey crew size from three to one. Robotic operation also eliminates the need for personnel to enter potentially hazardous work areas. Contamination risks, Personal Protective Equipment quantities, and personnel monitoring activities are all decreased as the necessity to physically enter radiological controlled areas is reduced. These advantages contribute to improved worker safety and to true time and cost savings.

RPTS technology is also utilized to monitor erosion along Paddy’s Run, an intermittent stream flowing from north to south along Fernald’s western boundary. The path of this very active stream is changing with time. Each month, RPTS collects measurement data, stores it on a compatible computerized memory log card, then seamlessly places the information into a surveying program which tracks the meandering stream path. The survey technology was instrumental in early corrective action required to shore and re-enforce the stream’s bank after it undercut a security fence. The technology provides immediate information in the field to alert project engineers and to mitigate the stream’s impact on man-made structures, including the Fernald Silos. Two of the four silos store low-level radium-bearing residues dating back to the 1950s. The automatic remote operation of this integrated system reduces the need for workers to climb hazardous stream banks, and the user-friendly database – with unlimited point storage capabilities – greatly increases surveying productivity. These features increase worker safety and lower costs.

(Prismless continued on page 7)



The Survey Remote Prismless Total Station supports Fernald’s engineering, construction, and environmental remediation activities

ing waste placement, and throughout construction of the cap – to verify the disposal cell is being constructed in accordance with its design and to create a map that provides tracking of waste placement for post closure use.

The technology’s real-time measurement analysis and automatic remote operation make it possible to take survey measurements constantly during site sampling. The prismless sys-

Under-Building Characterization

A new process and technology at Rocky Flats Environmental Technology Site was implemented to determine the effectiveness of horizontal directional drilling with environmental measurement while drilling (HDD/EMWD) in under-building contamination (UBC) characterization. The project characterized soils beneath the Building 123 slab and Building 886. Follow on samples were collected using conventional subsurface sampling to compare the effectiveness and cost efficiency of the HDD/EMWD process with conventional techniques.

The project consisted of drilling four horizontal directional drilling boreholes beneath the Building 123 slab, the site of the former Radiological Health Physics Laboratory, and one horizontal directional drilling borehole beneath Building 886, the former Critical Mass Laboratory. Samples were collected along with real-time Gamma Ray Spectrometer data to determine the extent of under building contamination.

Borehole lengths ranged from 45 to 190 feet at depths of 4 to 7 feet below ground surface, and targeted process waste lines and areas where under building contamination was suspected. Sample results have been received and are being compiled into a project completion report, expected to be available next quarter.



Waste minimization was effectively incorporated into this project. As originally scoped, the horizontal directional drilling was planned using traditional, rotary mud drilling methods that generate considerable waste. Instead, the horizontal directional drilling was accomplished using a hydraulic hammer, which practically eliminates generation of investigation, derived waste from the drilling process. Minimization of waste also decreased worker risk from contact with drilling fluids and minimized the potential to spread

contamination. Implementation of waste minimization resulted in cost savings for health and safety measures, waste containers, waste storage, shipment, and offsite disposal.

This project was funded by the Office of Science and Technology as a technology deployment of Sandia National Laboratory's Environmental Monitoring While Drilling (EMWD) technology to characterize potential UBC. Recently, the project was recognized with the 2001 DOE Pollution Prevention Award for its unique adaptation of horizontal directional drilling technology.

For more information contact Norma I. Castaneda, DOE Rocky Flats Field Office or 303-966-4226 or norma.castaneda@rf.doe.gov, Annette Primrose, Kaiser-Hill at 303-966-4385 or Annette.primrose@rfets.gov, or Tom Lindsay, RMRS, Rocky Flats Environmental Technology Site at 303-966-5705.

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RPTS is useful for verifying the amount of excavated material from six waste pits that range in area from one to five acres and vary in depth from 10 to 40 feet. Collectively, they contain about one million tons of low-level radioactive waste. The variety of RPTS coordinate geometry programs, including an area feature, enables Fernald users to automatically estimate soil volumes and to determine the volume of waste removed from waste pits. The surface-scanning feature is used to scan the bottom and embankments of each pit to measure and analyze cleanup progress. The visible red laser dot on the prismless instrument allows workers to aim at the waste pit measurement locations simply and precisely without having to look through the telescope. This feature increases accuracy, convenience, and productivity.

"RPTS is proving to be an effective measuring instrument during Fernald's remediation process, with improved worker

safety and tremendous savings in money and time" said James Schwing, Fernald land surveying and mapping manager. "The instrument pays for itself within nine months." The state-of-the-art optical total station provides highly accurate measurement of horizontal and vertical angles and linear distances. It is used across the site, increases productivity, reduces manpower hours and keeps personnel exposures ALARA (As Low As Reasonably Achievable).

For more information, contact James Schwing, Fernald Environmental Management Project, Fluor Fernald at (513) 648-5471 or james.schwing@fernald.gov



Aerial of Sandia National Laboratories, New Mexico

interest.” Sandia Corporation, a wholly-owned subsidiary of AT&T Corporation, managed and operated the laboratory until October of 1993. Congress designated Sandia Laboratories as a National laboratory in 1979. Today, Sandia National Laboratories (SNL) is managed and operated by Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, and includes government-owned facilities in Albuquerque, New Mexico (SNL/NM); Livermore, California (SNL/CA); Tonopah, Nevada; and Kauai, Hawaii. SNL/NM is headquarters and the largest laboratory, employing more than 6,600 employees, while SNL/CA is a smaller laboratory, with about 850 employees. Tonopah and Kauai are occupied on a “campaign” basis, as test schedules dictate.

Geographic Setting

The modern Kirtland Federal Complex (KFC) is made up of Kirtland Air Force Base (KAFB), the fifth largest military installation in the U.S. and a number of “tenant” organizations, including Department of Energy (DOE) facilities. KFC is located on a high, arid mesa about five miles east of the Rio Grande in Bernalillo County, New Mexico. The mesa is cut by the east-west trending Tijeras Arroyo (*arroyo* – a small steep-sided watercourse or gulch with a nearly flat floor, usually dry except after heavy rains), which drains into the Rio Grande. The east

side of the Kirtland Federal Complex north of Tijeras Arroyo is bounded by the southern end of the Sandia Mountains and south of Tijeras Arroyo by the Manzanita Mountains (foothills of the Manzano Mountains). Most of the Complex is relatively flat, sloping gently westward toward the Rio Grande. However, the eastern portion of the Complex extends into the canyons of the Manzanita Mountains. The western slope of the Manzanita Mountains is precipitous and rough and has numerous canyons and arroyos. The elevation in the Complex ranges from 5160 ft on the western side up to 7988 ft in the Manzanita Mountains on the eastern side. The mean elevation of the Kirtland Federal Complex is 5348 ft.

Both DOE and SNL/NM facilities are located within the Kirtland Federal Complex and include some co-use agreements on United States Air Force (USAF) property. An area of the Manzanita Mountains in the eastern portion of the approximately 80 square-mile Kirtland Federal Complex has been withdrawn from the United States Forest Service (USFS) for the exclusive use of the USAF and the DOE.

Albuquerque is located to the north and west of the Kirtland Federal Complex, and is the largest population center in New Mexico. The Isleta Indian Reservation borders the Kirtland Federal Complex on the south. The Pueblo of Isleta, located

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approximately 8 miles southwest of the Kirtland Federal Complex, had a population of 1,703 in 1990.

Technical Areas

SNL/NM consists of five technical areas (TA) and several additional test areas. Each TA has its own distinctive operations. A description of each technical area is given below.

TA-I Operations are dedicated primarily to three activities — the design, research, and development of weapon systems; limited production of weapon system components; and energy programs. TA-I facilities include the main library and offices, laboratories, and shops used by administrative and technical staff.

TA-II is a 45-acre (1.8 km²) facility that was established in 1948 for the assembly of chemical high-explosive main charges for nuclear weapons and later for production-scale assembly of nuclear weapons. Activities in TA-II include the decontamination, decommissioning, and remediation of facilities and landfills used in past research and development activities. Remediation of the Classified Waste Landfill which started in March of 1998, neared completion in FY2000. A testing facility, the Explosive Component Facility, integrates many of the previous TA-II test activities as well as some testing activities previously performed in other remote test areas. The Access Delay Technology Test Facility is also located in TA-II.

TA-III is adjacent to and south of TA-V [both are approximately 7 miles (8 km) south of TA-I]. TA-III facilities include extensive design-test facilities such as rocket sled tracks, centrifuges and a radiant heat facility. Other facilities in TA-III include a paper destructor, the Melting and Solidification Laboratory and the Radioactive and Mixed Waste Management Facility (RMWMF). RMWMF serves as central processing facility for packaging and storage of low-level and mixed waste. The remediation of the Chemical Waste Landfill, which started in September of 1998, is an ongoing activity in TA-III.

TA-IV, located approximately 1/2 mile (1 km) south of TA-I, consists of several inertial-confinement fusion research and pulsed power research facilities including, the High Energy Radiation Megavolt Electron Source (Hermes-III), the Z Facility, the Short Pulsed High Intensity Nanosecond X-Radiator (SPHINX) Facility, and the Saturn Accelerator.

TA-V contains two research reactor facilities, an intense gamma irradiation facility (using cobalt-60 and cesium-137 sources), and the Hot Cell Facility.

SNL/NM also has test areas outside of the five technical areas listed above. These test areas, collectively known as Coyote Test Field, are located southeast of TA-III and/or in the canyons on the west side of the Manzanita Mountains. Facilities in the Coyote Canyon Test Field include the Solar Tower

Facility, the Lurance Canyon Burn Site and the Aerial Cable Facility.

Environmental Restoration Overview

The ER Project is chartered with the assessment and, if necessary, the remediation of inactive waste sites. This assessment began formally in 1984 for SNL/NM, when DOE's Albuquerque Operations Office (DOE/AL) initiated the Comprehensive Environmental Assessment and Response Program (CEARP) to identify, assess, and remediate potentially hazardous waste sites. The project was designed to comply with Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Phase I of the CEARP, "The Installation Assessment," which identified 117 sites at SNL/NM, was submitted to U.S. Environmental Protection Agency (EPA) by SNL in September 1987. A similar investigation was conducted by the EPA Region VI in April 1987 during the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA). These programs ultimately defined a working inventory of Solid Waste Management Units (SWMUs) to be investigated during the course of the ER program at SNL/NM. The SNL ER Project has addressed ER sites at SNL/CA, Tonopah, and Kauai, as well as in locations not presently overseen by SNL. Work at all of these sites has been completed, so ongoing ER activities focus on SNL/NM SWMUs.

In 1987, SNL/NM sites were evaluated by the EPA under the EPA's CERCLA Hazard Ranking System (HRS), a risk-based system for prioritizing site cleanups. Based on the HRS ranking, no SNL/NM sites qualified for cleanup under the CERCLA National Priority List (NPL). For federal facilities that are not listed on the NPL, CERCLA requires compliance with state laws concerning removal and remedial actions.

Current investigations being conducted at SNL/NM for the ER Project are intended to determine the nature and extent of hazardous and radioactive contamination and to restore any sites where such materials pose a threat to human health or the environment.

SNL/NM has a Corrective Action Management Unit (CAMU) that is being used to store, treat, and permanently contain Environmental Restoration (ER) Project hazardous wastes from cleanup of the labs' Chemical Waste Landfill. The regulations governing CAMUs were established to encourage reduction of residual risks at clean-up sites through better control of contaminant sources without the significant expense associated with meeting offsite disposal requirements. SNL/NM's CAMU is located near the southeastern corner of Technical Area III, adjacent to the Chemical Waste Landfill. Public participation and stakeholder involvement were instrumental in the implementation of the CAMU. The SNL/NM CAMU was the first EPA-permitted facility of its kind within the DOE complex.

Sandia's Environmental Restoration Project

Sandia National Laboratories' Environmental Restoration (ER) Project is responsible for assessing and cleaning up Sandia sites containing hazardous and radioactive contaminants. The Project was formally initiated in 1990, and now includes a technical staff of more than 90 persons. Approximately 240 potentially hazardous sites have been identified to date, located in New Mexico, California, Nevada, and Hawaii. Of these, 200 have been either cleaned up or recommended for no further action, including those in California, Nevada, and Hawaii. Consequently, ER Project activities now focus on Sandia's New Mexico sites.

ER Project staff routinely team with industry and universities for help in completing assessments and remedial actions. Examples include teaming with a private company, using their computer-controlled mobile robotic arm and camera systems to visually inspect material, perform chemical and radiological surveys, and retrieve material selectively without coming in direct contact with hazardous constituents or environments. Project staff teamed with several universities in coordinated efforts to perform partitioning interwell tracer tests and biotreatability studies associated with the Chemical Waste Landfill.

ER Project teams have remediated three landfills – including a gas cylinder disposal pit, a radioactive waste landfill, and a



Field test of RETRVIR at a Waste Bottle Pit.

classified waste landfill. Procedures developed and expertise gained throughout this experience are being applied at other sites requiring similar excavation techniques.



Locating bits of depleted uranium.

Cleanup of low-level radioactive contamination scattered over a number of sites has also been completed. ER teams, working with private industry, catalogued and mapped about 4,000 hot spots, removed the radioactive material, and screened the remaining soil for residual activity – segregating just the contaminated material. This approach significantly reduced disposal and cleanup costs.

The ER Project, with the help of the Kirtland Air Force Base Explosive Ordnance Disposal group and unexploded ordnance specialists from private industry, remediated a site containing World War II vintage ordnance material in approximately 4000 cubic yards of soil piled in mounds. Other completed remedial actions include; removal of soils contaminated with jet fuel, removal of more than 25,000 cubic yards of construction debris from three sites, cleanup of depleted uranium sites, removal of PCB contaminated soils, and cleanup of metal fragments from a firing site.

(ER continued on page 12)

(Monolayer continued from page 5)

Therefore, the operational cover over the majority of the waste units at NTS require little cover augmentation to achieve the long term performance requirements. Figure 2 shows a cross-section of the NTS vegetative monolayer cover design.

One unexpected benefit associated with the deployment of the vegetative monolayer cover at NTS is reduced construction costs. A multilayered cover design requires much greater quality control (i.e., geotechnical soil properties, compaction standards, labor intensive installation of low permeability layer, etc.) than a monolayer cover. A monolayer cover can use native soil and issues such as subsidence are not critical design criteria. At the majority of the NTS landfills, due to the thick

operational cover already in-place, the volume of additional soil required to complete the closure is less than is required for a multilayered cover.

Two vegetative monolayer covers have been installed at NTS. Details of cover regulatory approval, cover construction, cover performance monitoring, and construction cost information will be provided in more detail during presentations at the Alternative Cover Session of the 2001 TIE Workshop in Albuquerque, New Mexico.

For more information contact Jeffrey L. Smith, U.S. Department of Energy, Nevada Operations Offices at (702) 295-7775 or smithjl@nv.doe.gov.

Exploring **Science-Based Solutions and Technologies**



Spectrum 2002

Spectrum 2002 is an International Conference with a primary focus on resolving technical issues, deploying improved technologies and strengthening the science-based decisions for Nuclear and Hazardous Waste Management applications. The 9th biennial Spectrum conference enables an extensive international exchange of information related to defensible science-based solutions and improved technologies. The objective is to provide new opportunities for commercialization of products and services for nuclear waste management including decommissioning and decontamination, and environmental restoration.

The technical program focuses on opportunities for: deployment and evaluation of new technologies; science and technology application to environmental decisions; and accelerating the deployment of advanced technology to emerging environmental problems.

Special sessions are planned on understanding the challenges of long-term stewardship and reducing the uncertainties associated with predicting contaminate fate and transport in the subsurface.

"Call for Papers"

Contributors are invited to submit 1,200 to 1,500 word summaries. Summaries should contain sufficient detail to allow the technical merit of the paper to be judged. For general information on the conference and the "Call for Papers" please visit the Spectrum web or call the number listed below.



SPECTRUM 2002

Roger Mayes, Technical Paper Coordinator

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Web site: <http://www.ans.org/spectrum>

For more information, please visit www.ans.org/spectrum.

(Ten Years continued from front page)

The Albuquerque workshop promises to continue the TIE tradition, and Sandia National Laboratories (SNL) is pulling out all the stops to host it. The proposed topics are timely, and initial response indicates there will be a very full agenda of panel presentations, interactive poster sessions, posters, exhibits, and special working sessions. A general description of the proposed workshop topics, a background article on the SNL site tour, and the workshop registration form are included in this *TIE Quarterly*. Take time to look things over, submit your registration, and we'll look forward to seeing you in November!

(ER continued from page 10)

The ER Project staff has developed expertise in hydrological investigations, vapor-phase remediation projects, and human health and ecological risk assessments. The Project has also developed good teaming relationships with state and regional regulators and with the local Citizens' Advisory Board. The staff is available for consulting and for sharing their collective expertise with other DOE sites and Federal agencies.

See you in Albuquerque!

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TIE Workshop Lead
Mary McCune
U.S. DOE Headquarters

Editor in Chief:
Adrienne DeBacker
Project Enhancement Corporation

Executive Editors:
Lawrence Ball
URS Corporation
Blaine Rowley
U.S. DOE Headquarters

Managing Editor:
Sherie Earle ten Hoope
Project Enhancement Corporation

If you have a question or wish to contribute to the **TIE QUARTERLY**, please contact:

Adrienne DeBacker
Project Enhancement Corporation
6809-D Bowman's Crossing
Frederick, MD 21703
Phone: 301.668.7177
Fax: 301.668.7277
Email: amg@erols.com

UNITED STATES DEPARTMENT OF ENERGY
19901 GERMANTOWN ROAD
GERMANTOWN, MD 20874-1290
EM-22 - McCune
OFFICIAL BUSINESS